An exploratory economic evaluation of the impact of improving clinician adherence to stroke clinical guidelines

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ABSTRACT

Objective: Little is known about the economic impact of implementing Clinical Guidelines for Stroke Management (CGSM) in Australian private hospitals. This study completed an exploratory economic evaluation of a clinician-led CGSM implementation intervention, within an Australian private health service.

Methods: Observational study of inpatient stroke cohorts. Primary outcome: cost-effectiveness of the CGSM implementation process for acute and rehabilitation wards from a health care sector perspective. Secondary outcome: CGSM implementation cost. Data were collected pre and post CGSM implementation via medical record audits, health service administration and surveys. Cost analyses used public health modelled data and individual patient health service data.

Results: Acute: no significant differences in cost per patient with a difference in modelled data of $160 (95%CI: -$5,061 to $4,741, p=0.499) (AUD$160; Euro€103; USD$119); and health service data of -$422 (95%CI: -$1,482 to $2,326, p=0.665) (AUD-$442; Euro-€284; USD-$329), or in functional status MRS -0.18 (95%CI -0.44 to 0.07, p=0.16) following implementation of CGSM. Rehabilitation: non-significant increase in cost per patient with modelled data reporting a difference of $5,969 (95%CI: -$12,230 to $291; p=0.070) (AUD$5,969; Euro€3,829; USD$4,443) and a statistically significant improvement in functional status [FIM 10.45 (95%CI: 0.4 to 20.5), p=0.041] post-implementation of CGSM. The incremental cost effectiveness ratio was an additional $1,605 (AUD$1,605; Euro€1,030; USD$1,195) per 1-point FIM score gained. CGSM implementation cost was $154,717 (AUD$154,717; Euro€99,281; USD$115,186) and it utilised 2,099 staff hours.

Conclusion: While CGSM implementation in private health did not result in cost savings, there was a positive effect on patient function during rehabilitation.

Key Words: *Stroke; Clinical guidelines; Private health service; Implementation; Health economics; Cost-effectiveness*

INTRODUCTION

With the current economic pressure on the Australian health system, cost-effective evidence-based care is essential [1]. Decision makers decide how best to use the limited resources they have for clinical services to maximise the benefits to individuals, society and the economy [2] and this is known as value-based care [3]. As health care leaders are responsible for both clinical and economic outcomes [4], they will consider both clinical and economic data in decision-making. This wholistic approach requires health care leaders to understand the cost-benefit of implementing evidence-based programs in clinical settings and this could aid the translation of scientific advancements into the clinical practice.

Stroke is common and it is estimated that over 80 million people world-wide experience a stroke every year [5]. Post stroke care is associated with significant costs in acute and rehabilitation settings [6]. Adherence to Clinical Guidelines for Stroke Management (CGSM) can improve survival and quality of life [7]. The presence of a dedicated stroke unit is thought to improve the quality of care and to reduce costs [8,9].

While studies support that adherence to the CGSM criteria of a stroke unit improves patient outcomes [7, 10], few studies exist on the

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economic impact [9,10]. In addition, the economic evaluations which do exist focus on stroke care in public hospitals, not private. Differences exist between public and private health care in Australia and these include reduced wait time, choice of specialist and co-payments for private health [11]. In Australia, across the acute and rehabilitation settings, private health services manage more than a quarter of the stroke admissions [12], yet there is no published literature reporting on the clinical or economic impact of improved adherence to the CGSM criteria for Australian private health services. This exploratory economic evaluation aims to address this gap by reporting the economic impact of adherence to CGSM in an Australian private health service.

Aim

The primary aim was to determine if the implementation of CGSM was cost-effective in an Australian private health service by evaluating health service costs and the effects of CGSM implementation on patient functional status. The secondary aim was to report the cost of implementation.

METHODS

Primary aim: Cost-effectiveness

We have reported findings in accordance with the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement [1]. The CGMS in this implementation study were from the National Stroke Foundation (Australia) and provide best practice recommendations that are consistent with international CGSM [13-15].

Design

We conducted an observational pre-post study in a large private health service in Victoria, Australia. Our study included two cohorts: the post-intervention cohort was captured prospectively following implementation of the CGSM and the pre-intervention cohort was captured retrospectively. The primary outcome was the cost effectiveness in acute and rehabilitation care where effect was a measure of patient function (Functional Independence Measure (FIM) and Modified Rankin Scale (MRS) [16, 17]. Data were collected before and after implementation of the clinical guidelines via medical record audit for patient functional status, health service administrative data for admission costs and surveys for implementation costs.

Intervention

The intervention was the implementation of CGSM across acute and rehabilitation inpatient care and this has been detailed in a related publication [18]. The CGSM contained 72 clinical practice recommendations across acute and rehabilitation care focused on nursing, allied health and medical management. Prior to this, care was clinician-dependent, rather than clinical guideline dependent. A pragmatic, clinician-led implementation process was used with support from a research team [19]. To improve adherence to the criteria within the CGSM, the CGSM was embedded into the health service stroke care policies. The CGSM implementation intervention included staff and patient communication strategies and staff auditing strategies to provide staff with ongoing, timely feedback on the adherence of stroke care to the CGSM criteria. Staff were also provided with multiple CGSM education opportunities where attendance was recorded, however staff competencies were not assessed. From pre to post-CGSM implementation, adherence significantly improved for 15% (n=11/72) of the criteria across acute and rehabilitation services.

Setting

The setting was a not-for-profit private health service located in Melbourne, Australia, with over 800 acute care beds across two acute hospitals, and 60 rehabilitation beds across two rehabilitation hospitals. Prior to 2014, stroke services were a small part of acute care with around 100 admissions per year. There were three pathways for the admission of patients with a stroke diagnosis. The first was an acute emergency admission for stroke either via ambulance or self-presentation, the second was a patient already admitted to the health service who had a stroke during the admitted care, and the third was an elective admission to rehabilitation following acute stroke care at another health service. Funding was most commonly from Private Health Insurance. Admission to private versus public health for emergency admissions was dependent on funding availability, patient family choice, and medical ambulance recommendations.

Participants and study design

Participants were adults admitted to the health service with a primary diagnosis of stroke, pre CGSM implementation (2014; pre-intervention cohort) or post CGSM implementation (2015; post-intervention cohort). As the evaluation methodology was based on auditing 100 consecutively admitted patients in both cohorts, the cohorts could not be matched at baseline. However, important clinical characteristics were reported at baseline to determine cohort similarities and differences. The implementation of the CGSM occurred between September 2014 and June 2015, with the audit of the post-intervention cohort between August 2015 and May 2016. Informed consent from the patient participants was not required as data collection was via audit of usual care data.

The time horizon for acute was from acute admission to acute discharge, and for rehabilitation was from rehabilitation admission to rehabilitation discharge. Costs therefore only included inpatient admission costs, not post stroke care in the community outpatient setting nor readmissions. Individual patient cost data, related to each inpatient admission, were extracted from the health service business intelligence unit.

Patient functional status was collected via medical record audit using the MRS in acute and the MRS in addition to the FIM in rehabilitation [17,20]. The MRS has a scale of 0 to 6 where a score of 0-2 indicates independent function (higher score reflects lesser function). The FIM consists of 18 items and each item is rated on a 7-point scale with total scores which range from 18 (dependent) to 126 (independent). In the acute setting the MRS was reported for three time points: pre-admission (*via* patient or family recall), and on admission to, and discharge from, acute care. In the rehabilitation setting both the MRS and the FIM were used as measures of function and these were reported on admission and discharge to rehabilitation.

Analyses

The economic evaluation had a healthcare sector perspective as it only includes direct health service inpatient costs. Cost analysis was conducted two ways, firstly using public health modelled data and secondly using individual patient health service cost data. Firstly, using published public health data, acute and rehabilitation cost data were modelled based on the individual patient length of stay. The length of stay was multiplied by a daily cost that was based on the National cost per diem for an acute or a rehabilitation admission, presented in AUD$2015-2016. The cost per diem for an acute admission was $2,003 and the cost per diem for a rehabilitation admission was $1,070 [21]. As length of stay was used as a proxy to calculate the inpatient admission costs, this variable was not controlled in the analysis.

Secondly, acute cost data were collected at an individual patient level from the health service administrative data system for acute admissions, however this was not available for the rehabilitation admissions. Due to "commercial in confidence" of private health service cost data only the mean cost difference is presented for this second cost analysis. Cost data for the pre-intervention cohort were collected in AUD$2013-2014 (72%) and AUD$2014-2015 (28%). Cost data for the post-intervention cohort were collected in AUD$2015-2016. To inflate the pre-intervention data to AUD$2015-2016 (to be consistent with the post-intervention data) the AUD$2013-2014 were inflated by the CPI of 1.5% into AUD$2014-2015, and then all AUD$2014-2015 were inflated by the CPI of 1.0% into AUD$2015-2016 (22). This resulted in all cost data being presented in AUD$2015-2016 [22].

Mean cost difference was analyzed between the two groups using an independent t-test based on the total cost of the acute admission [23]. Between-group differences for functional status were based on the change score and this was determined using an analysis of covariance (ANCOVA) of the discharge score using the admission score as the covariate [23,24]. This was completed for the acute care admission (MRS) and the rehabilitation care admission (MRS and FIM). An incremental cost effectiveness ratio (ICER) reports the incremental difference in cost against the incremental difference in effect for the acute and the rehabilitation admissions. The ICER for acute and rehabilitation care was established when a significant difference existed between the cost and\or the effect and this included the reporting of confidence intervals using the bootstrap method (5,000 repetitions) [24] with results presented as an ICER mean value, as well as an ICER point estimate with confidence ellipses.

Analyses were completed using IBM SPSS Statistics Version 24 [25] and customized software in Microsoft Excel [24]. All statistical tests were conducted at 5% level of significance and 95% Confidence Intervals (CI).

Secondary aim: Cost of implementation

Design

An internet survey was used to obtain data on the cost of stroke guideline implementation. This part of the study is reported in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) for internet survey studies [26]. The cover letter inviting staff to participate in the internet survey outlined the length of time of the survey (estimated at 15 minutes), the investigators and the purpose of the study. The cover letter also explained that participation in the survey was voluntary, that choosing to participate indicated implied consent for participation, and that withdrawal of the survey responses was not possible once the survey had been completed as responses were anonymous (see Supplementary File). All data were stored on password protected documents and the results were de-identified. There were no incentives to complete the survey. The staff survey had 16 items which utilised 13 screens. No items were mandatory and all items offered a "not applicable" option. Participants were able to review and change their answers. Data from the survey was supplemented with data that were documented in Stroke Service Development Committee meeting minutes in an attempt to capture a more robust set of cost of implementation data.

The questions regarding cost of implementation asked participants to report time spent attending meetings, preparation of patient and staff education resources, attendance at education, cost of equipment and other related costs. The cost of implementation relates to the period of time planning the implementation of the CGSM as well as the first 10 months of implementation when the CGSM transitioned to usual care.

Development and pre-testing

The survey was developed by a co-investigator (SF) using Survey Monkey and its usability and functionality were tested by the principal investigator (NB) and other co-investigators (HF, DM) prior to its release.

Participants and recruitment process

Participants for the cost of implementation survey were staffs from the private health service who were invited via email to complete the survey. The opportunity to participate was only extended to staff who were involved with stroke services. While competency in stroke services was not assessed in the survey, years of experience in stroke services was determined.

Analyses

Analysis for the cost of implementation (direct staff and operational costs) was descriptive, reporting the mean value for each cost category and the total cost of implementation for staff resource utilisation within and outside of work hours. Each of the following CGSM implementation strategies were recorded and costed for the cost of implementation analysis; staff time for targeted communication (emails; updates during clinical handover/department meetings; written material), staff attending and providing education (staff practical and on-line aphasia training; presentations during clinical handover/department meetings; posters; handouts) and staff time to audit if clinical practice was aligned to the CGSM criteria.

A number of assumptions were made during this analysis and these include the following: all costs are reported in $AUD2015-2016 (current at the time of data collection); all meetings went for a duration of one hour; the rate of pay, $55.83 per hour (Private

Health Service Nurse Unit Manager Enterprise Bargaining Agreement 2015; Nurse Unit Manager Option 1, Year 2), was selected for meetings to represent the average seniority, and therefore average wage rate, at each meeting. On-costs of 23% were added to the base rate to reflect actual salaries, wages and allowance costs to this private health service, for a final hourly rate of $68.66. The on-cost of 23% was determined by the health service finance department to reflect the current financial calculations. Further assumptions included time spent outside of work doing un-paid tasks that related to the CGSM implementation also valued at $68.66 per hour to represent the opportunity cost to the staff member. To address the potential for missing data in the survey responses, when the supplementary data reported a higher number of units than that which was reported in the staff survey, the higher amount from the supplementary data was used to calculate the cost of implementation, for example, staff attendance at the Stroke Service Development Committee meetings may not be fully captured in the survey as it is expected that not all committee members have completed the survey, yet the Stroke Service Development Committee meeting minutes would report complete attendance records.

RESULTS

Primary aim: cost-effectiveness

Respectively, the acute pre-intervention cohort (n=99) and post-intervention cohort (n=91) had a mean age of 80.1 years (SD 11.7) and 79.1 years (SD 12.9); 50 (51%) and 51 (55%) were females; 80 (81%) and 72 (79%) had an ischaemic stroke; and 51 (52%) and 58 (64%) had independent function on admission (MRS of 0-2 on admission to acute) (further details see Supplementary File).

In acute care, modelled cost data reported a mean cost of $17,186 (SD 16,667) for the pre-intervention group (n=99) based on an average length of stay of 8.6 days (SD 8.3) and $17,346 (SD 18,440) for the post-intervention group (n=91) based on an average length of stay of 8.7 days (SD 9.2). Therefore, post-intervention there was no difference in cost [modelled data $160 (95%CI: -$5,061 to $4,741, p=0.499); health service data -$422 (95%CI: -$1,482 to $2,326, p=0.665)]. In addition, there was no between group difference in function from pre-morbid status, on admission or on discharge, or on the between group change score [MRS -0.18 (95%CI -0.44 to 0.07, p=0.16)] (Table 1). The effect size for length of stay, cost and MRS change score were 0.01, 0.18 and 0.20, respectively. Due to the finding of no difference in cost or effect, the planned cost-effectiveness analysis was not completed.

Respectively, the rehabilitation pre-intervention cohort (n=19) and the post-intervention cohort (n=19) had a mean age of 82.1 years (SD 8.6) and 82.2 years (SD 8.5); 10 (53%) and 10 (53%) were females; 18 (95%) and 16 (84%) had an ischemic stroke; and 4 (21%) and 2 (11%) had independent function on admission (MRS of 0-2 on admission to rehabilitation).

In rehabilitation care, cost data reported a mean cost of $14,586 (SD = 7,268) for the pre-intervention group (n=19) based on an average length of stay of 13.6 days (SD = 6.8) and $20,555 (SD =11,231) for the post-intervention group (n=19) based on an average length of stay of 19.2 days (SD =10.5). Therefore, post-intervention there was a non-significant cost increase per patient [modelled data $5,969 (95%CI: -$12,230 to $291; p=0.070); health service data not available], a non-significant difference in length of stay (MD -5.6 days; 95% CI -11.74 to 0.47; p=0.070) and a significant improvement in function for the FIM [10.45 (95%CI: 0.4 to 20.5), p=0.041] but not for the MRS [0.22 (95%CI: -0.56 to 1.00), p=0.56] (Table 1). The effect size for length of stay, cost and FIM change score were 0.61, 0.51 and 0.51, respectively.

TABLE 1

Patient functional outcome data

	Groups										Difference Between Groups		
	Prior to stroke		Acute Admission		Acute Discharge		Rehab Admission		Rehab Discharge		Acute Admission compared to Acute Discharge (Pre minus Post)	Acute Admission compared to Rehab Discharge (Pre minus Post)	Rehab Admission compared to Rehab Discharge (Pre minus Post)
	Pre n=99	Post n=91	Pre n=99	Post n=91	Pre n=99	Post n=91	Pre n=19	Post n=19	Pre n=19	Post n=19			
MRS, mean (SD)	1.5 (1.4)	1.3 (1.5)	3.2 (1.3)	3.0 (1.4)	2.9 (1.7)	3.0 (1.6)	3.6 (0.7)	3.4 (0.5)	2.5 (1.5)	2.2 (1.1)	-0.18 (-0.44 to 0.07), p=0.16	.28 (-0.53 to 1.08), p=0.49	.223 (-0.56 to1.00),p=0.56
FIM, mean (SD)	n/a	n/a	n/a	n/a	n/a	n/a	77.4 (19.8)	81.2 (13.1)	89.8 (23.9)	105.8 (12.9)	n/a	n/a	-10.45 (-20.5 to -0.4), p=0.041

MRS: Modified Rankin Scale; FIM: Functional Independence Measure; Pre: Pre-intervention cohort; Post: Post-intervention cohort

Note: MRS, a lower score indicates a higher functional status; FIM, a higher score indicates a higher functional status

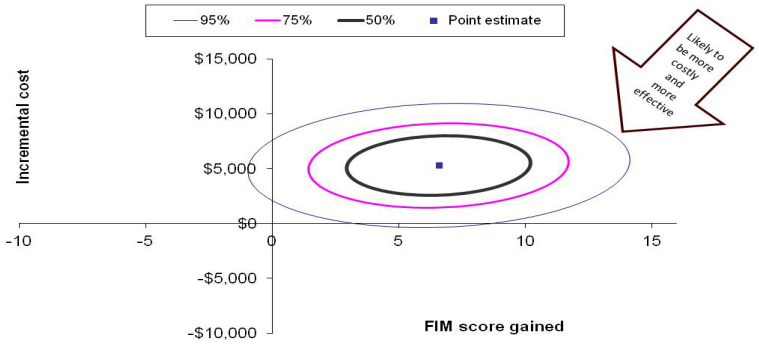

Figure 1) *Incremental cost effectiveness ratio for the implementation of clinical guidelines for stroke management: ratio of incremental cost difference to incremental FIM score difference in rehabilitation ($AUD)*

The Incremental cost effectiveness ratio was an additional $1,605 per FIM score gained in the post-intervention group compared to the pre-intervention group indicating that post-intervention (i.e., post CGSM implementation) is likely to be more costly and more effective (Figure 1).

TABLE 2
Cost of implementation reported via the staff survey

Implementation costs	Within paid work hours			Outside of paid work hours / in-kind staff contribution			Total Cost
	Number of units	Cost per unit	Cost	Number of units	Cost per unit*	Cost	
Attendance at Stroke Service Development Committee meetings	131[a]	$68.66	$8,994	1	$68.66	$69	$9,063
Preparation for Stroke Service Development Committee meeting	95	$68.66	$6,523	73	$68.66	$5,012	$11,535
Attendance at informal sub-working party meetings[∞]	230	$68.66	$15,792	21	$68.66	$1,442	$13,801
Preparation for informal sub-working party meetings	134	$68.66	$9,200	83	$68.66	$5,699	$14,899
Development of policies, procedures and protocols	48	$68.66	$3,296	58	$68.66	$3,982	$7,278
Development of department specific guidelines	57	$68.66	$3,914	24	$68.66	$1,648	$5,561
Development of staff educational material (stroke education program)	90	$68.66	$6,179	150	$68.66	$10,299	$16,478
Provision of staff education (stroke education program)	194	$68.66	$13,320	44	$68.66	$3,021	$16,341

Attendance at staff education activities: stroke education program, 66 nurses @ 4hours	528[b]	$68.66	$36,252	58	$68.66	$3,982	$58,361
Attendance at staff education activities: Swallowing Assessment Training, 10 nurses @ 8 hours	80[c]	$68.66	$5,493	0	$68.66	$0	$5,493
TOTAL HOURS	1,587	-	$108,963	512	-	$35,154	$144,117
Equipment purchases#	3	N/A	$10,600	N/A	N/A	N/A	$10,600
Stroke Care Coordinator 0.5EFT*	0.5	N/A	N/A	N/A	N/A	N/A	$69
Total costs	-	-	$119,563	-	-	$35,154	$154,717

[a] This includes the Stroke Allied Health and Stroke Care Co-ordinator meetings and the Stroke Rehabilitation meetings.

** There is no organisational cost associated with the Stroke Care Coordinator position as this was a reallocation of a current staff member into this position (staffing levels remained status quo).*

 # Equipment purchased during the implementation of CGSM included a ward based therapy equipment including a tilt table, recline wheel chair and a chair with lateral supports ($9,000), a tilting shower chair ($1,500), as well as four copies of the Motor Assessment Scale ($100).

[a, b, c] Supplementary data was used to populate this data, as the supplementary data was greater than that received through the staff survey. Lesser survey results reported [a]80 units; [b]84 units; [c]zero units.

Secondary aim: cost of implementation

The staff survey was completed by 36 of the 75 invited participants (48%). Participants were mostly female (n=26; 72%), aged 40-59 (n=17; 47%), had a mean of 14 years' (SD 9) experience in stroke services and 24 (67%) were based in the acute setting and 10 (28%) were based in the rehabilitation setting. Supplementary data were collected from five Stroke Service Development Committee meeting minutes (Table 2).

The cost of CGSM implementation was $154,717 and this extended to both the acute and rehabilitation settings over 17 months (February 2014 until June 2015). It included the staff time and resources required for formal committee meeting, working parties which fed into the committee meetings, development of policies, procedures and protocols, and the development, provision and attendance at staff education (general stoke care and aphasia specific training).

Staff training was extensive and included all nursing staff across acute and rehabilitation stroke services attending a 4-hour module. The module was interactive and included presentations from medical, nursing and allied health staff highlighting key elements of the CGSM. In addition, 10 nurses attended an additional eight hours of Swallowing Assessment competency based training by a speech pathologist.

As not all staff members who were involved in the implementation of CGSM completed the staff survey reporting resource utilisation, it is assumed that the hours reported through the staff survey alone were a conservative estimate of the cost of implementing the CGSM. Of the total 2,099 staff hours directed towards implementation, 1,587 (76%) were reported within work hours and 512 (24%) were reported outside of work hours (unpaid).

DISCUSSION

Following the implementation of stroke clinical guidelines in the rehabilitation setting, there was a non-significant increase in cost together with significantly improved functional status in patients. In contrast, implementation of CGSM guidelines in the acute setting did not change the admission cost, patient functional status or length of stay. The acute ward findings agree with a Cochrane systematic review reporting that improved adherence to stroke clinical guideline criteria, specifically the provision of an acute stoke unit, did not reduce hospital length of stay [7]. Co-location is the physical co-location of stroke beds within a stroke unit with a geographically dedicated area or ward (rather than dispersed across the hospital) and it was reported in a related publication, that for the current patient cohorts there was 49% physical co-location in an acute stroke unit pre-CGSM implementation and 54% post-CGSM implementation [18]. We hypothesized that it was this lack of physical co-location in an acute stroke unit which may have hindered the ability to truly co-ordinate specialized care, reduce length of stay and therefore reduce cost.

The difference in length of stay between the rehabilitation pre-intervention cohort (13.6 days) and the post-intervention cohort (19.2 days) was not significant (p=0.070). If the difference was real, just underpowered for significance, the difference could be due to the CGSM implementation in rehabilitation which resulted in a change in clinical services offered to patients post stroke. It is possible that the CGSM implementation which influenced the in-patient rehabilitation culture to support more complex goal setting and patient education, over a greater period of time to achieve greater gains in function.

The staff involved in the cost of implementation survey were from a range of professions including clinical and senior leadership staff from nursing and allied health, junior and senior medical staff,

hospital directors and executive directors. This was representative of the same range of staff seniority on the governance committee which provided oversight to the implementation process. Of note, almost a quarter of the staff time to implement the CGSM was outside of paid work hours. As illustrated by Slade et al (2019) dedicated time for evidence-based practice is an important factor for adopting a research culture in allied health professions [27]. Moreover, Wenzel et al (2020) noted that clinicians take this into account when prioritizing clinical practice activities [28]. The feasibility of increasing the dosage of therapy received by rehabilitation patients is also related to dedicated staff time [29]. A previous systematic review reported the cost of various guideline implementation, however unlike the current study, many of the included economic evaluations did not define the type of economic evaluation, nor report the price year, adjustment for inflation, details for method, quantified resource utilisation or the cost of treatment [2].

A limitation of this investigation was that we used public health modelled cost data as well as partially reported private health service administrative cost data. It is unknown if the "commercial in confidence" limitation of publishing private health service administrative cost data has contributed to the paucity of published private health service economic evaluations. Another limitation was the comparatively small sample size, with 190 patients in the acute analysis and 38 in the rehabilitation analysis, as well as the use of an outcome measure (FIM) which has limited international generalisability as it is no longer routinely in use in the USA (CARE Item Set and B-CARE CMS). The use of the FIM is an example of a local contextual factor which affected our data set. Finally, the time horizon of the study presents as a limitation due to unknown durability of the functional gains and the potential of a downstream cost shift. There is a need for long-term cost analyses examining the implementation of CGSM to understand the sustainability of the intervention, the long-term impact on patient outcomes (as we know gains in rehabilitation can be sustained in the 12 months post discharge [30], as well as any shift in the downstream health care utilisation and costs. This explorative economic evaluation will enable future research to build on the current methodology and address the limitations. It also highlighted future design considerations, for example the use of individual level patient costs data versus modelled cost data based on a per diem rate, as we found both methods reviled a non-significant cost difference in acute dare, however the direction of the difference varied from positive to negative.

Despite the limitations, this explorative economic evaluation is of immense value as it is a starting point for private health services to share the clinical and economic impact of implementing evidence based practice. While the only significant finding was an improvement in patient function in rehabilitation, further investigation is required to examine if the observed yet non-significant differences in cost are significant when fully powered. Based on the literature to date, we need to continue to strive towards consistent evidenced based practice, such as that detailed in the CGSM, to improve survival and quality of life and to determine with certainty, the financial impact for the health service.

CONCLUSIONS

While CGSM implementation in private health did not result in cost savings, there was a positive effect on patient function during rehabilitation.

FUNDING

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DISCLOSURE OF INTEREST

The authors report no actual or perceived conflicts of interest.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This project obtained ethics approval from the Cabrini Human Research Ethics Committee (CHREC 05-05-10-15). It was communicated to staff and patients who participated in the surveys that participation was voluntary and consent was implied if the individual completed the survey. Patient data extracted from the medical records did not require individual patient consent as the data were routinely collected and no individual patient data were to be presented.

AVAILABILITY OF DATA AND MATERIAL

The datasets generated during and / or analysed during the current study are not publicly available due to "commercial in confidence" of data from the private health service, however, some of the dataset is available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTION

Authors NB, SF, HF, DM, SG, CB and CK contributed to the study concept and design. Authors NB, SF, SG, DM contributed to the data collection. Authors NB, HF, MEM, SF, SG and DM were the major contributors to the manuscript writing. All authors read and approved the final manuscript.

ABBREVIATIONS

CGSM: Clinical Guidelines for Stroke Management.

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